

Cat Scratch Disease in the United States: An Analysis of Three National Databases

ABSTRACT

Objectives. Current knowledge of the epidemiology of cat scratch disease is based primarily on information from case series. We used three national databases to obtain more representative data to determine the incidence and demographics of cat scratch disease.

Methods. Records coded with the diagnosis of cat scratch disease from two hospital discharge databases and an ambulatory care database were analyzed. Costs of diagnostic tests and hospitalization were obtained from a sample of providers and published data.

Results. The incidence of patients discharged from hospitals with a diagnosis of cat scratch disease was between 0.77 and 0.86 per 100 000 population per year. Fifty-five percent of the case patients were 18 years of age or younger. Males accounted for 60% of cases. Incidence varied by season; approximately 60% of case patients were discharged in the months September through January. The estimated incidence of disease in ambulatory patients was 9.3 per 100 000 population per year. On the basis of these rates, we estimated the annual health care cost of the disease to be more than \$12 million.

Conclusions. The rates and seasonality of cat scratch disease found in this study were consistent with previous reports. Adults represented a higher percentage of the total than reported in previous case series, suggesting that the disease may affect more adults than previously recognized. (*Am J Public Health.* 1993;83:1707-1711)

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Introduction

Cat scratch disease is classically characterized by persistent regional lymphadenopathy in an area draining lymph from the site of a recent cat scratch. Recent evidence suggests that *Rochalimaea henselae*, a bacterium that has been isolated from patients with bacillary angiomatosis,¹ is associated with cat scratch disease.²⁻⁴ Case series have been the primary source of information on the age distribution, seasonality, and clinical characteristics of cat scratch disease since it was first recognized in the United States in the 1940s.⁵ Although these reports have contributed greatly to our understanding of the disease, they are subject to geographic and referral biases, and because they are not population-based, they cannot be used to determine rates of disease. Advances in identifying the etiology of the disease, with the associated implications for improvement in diagnostic capabilities and treatment, emphasize the need to determine the magnitude of the disease and the population primarily affected by it. We used information from two large hospital discharge databases and an ambulatory care database to describe the epidemiologic features and estimate the health care costs of cat scratch disease in the United States.

Methods

Abstracted hospital discharge records from the Commission on Professional and Hospital Activities (CPHA) and the National Hospital Discharge Survey (NHDS) were analyzed. Participation in CPHA is voluntary and the percentage of short-stay hospitals participating varies by state and year. The ratio of the number of discharges from CPHA hospitals in a state

in a given year to the total number of hospital discharges for the state (as reported by the American Hospital Association) in that year was used to calculate a weight variable to allow extrapolation to national estimates. Records from 1983 through 1989 with cat scratch disease as any one of as many as 22 discharge diagnoses coded were analyzed.

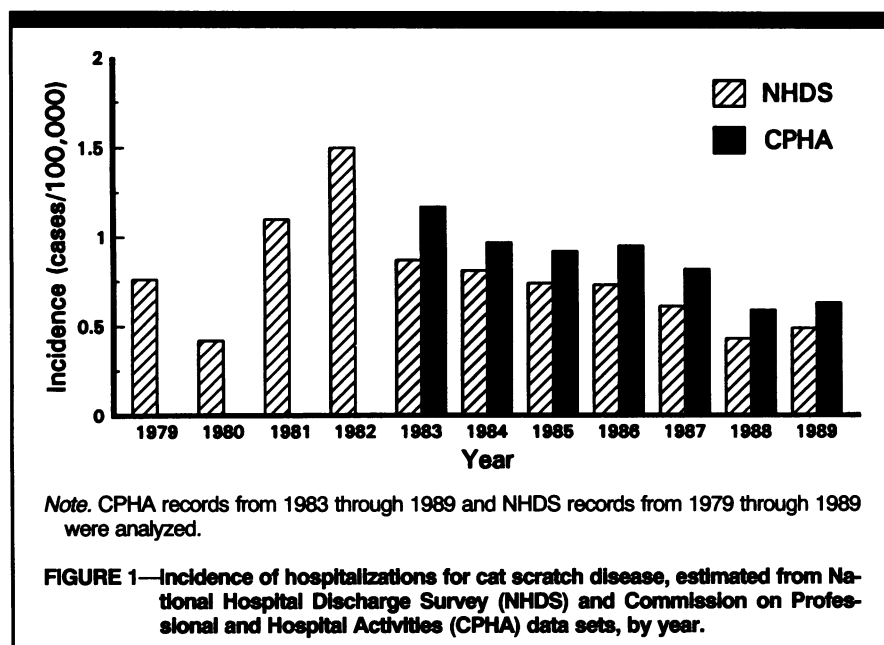
NHDS is a continuous national survey of inpatient utilization of short-stay hospitals conducted by the National Center for Health Statistics (NCHS). Survey data are abstracted from a sample of medical records of patients discharged from nonfederal short-stay hospitals chosen systematically on the basis of hospital size. A weight variable is provided by NCHS to allow extrapolation to national or regional estimates. Records from 1978 through 1989 with cat scratch disease as any one of as many as seven discharge diagnoses coded were analyzed. The relative standard error for the number of records with a diagnosis of cat scratch disease was calculated using information provided by NCHS⁶ and was used to determine the 95% confidence intervals (CIs) for the weighted estimates.

The National Ambulatory Medical Care Survey is conducted intermittently by NCHS and provides data from outpatient records selected from a national sample of office-based physicians. A weight variable is provided by NCHS to allow extrapolation to national or regional estimates. Surveys were conducted in 1980,

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1981, 1985, and 1989; records with cat scratch disease as any one of the three physician diagnoses coded from these surveys were analyzed. The relative standard error could be calculated from the information provided by NCHS records only for 1985; this figure was used to determine the 95% confidence interval of weighted estimates for that year.

All diagnoses and procedures were coded with *International Classification of Diseases, 9th Revision: Clinical Modification* (ICD-9-CM) codes.⁷ Code 078.3 (cat-scratch disease) was used to extract records with the diagnosis of cat scratch disease, and codes 40.0 (incision of lymphatic structures), 40.1 (diagnostic procedures on lymphatic structures), 40.11 (biopsy of lymphatic structure), 40.19 (other diagnostic procedures on lymphatic structures), 40.2 (simple excision of lymphatic structure), 40.21 (excision of deep cervical lymph node), 40.23 (excision of axillary lymph node), 40.24 (excision of inguinal lymph node), 40.29 (simple excision of other lymphatic structure), and 40.3 (regional lymph node excision) were used to extract records with lymph node procedures (excluding excision of internal mammary lymph nodes and radical excision or dissection of any lymph node).

Population estimates were obtained from the US Bureau of the Census.⁸ All rates are expressed as cases per 100 000 population per year. Regions listed correspond to those described by the Bureau of the Census. All calculations were performed after records were weighted as described above.

Cost estimates for diagnostic tests and invasive procedures were based on the average price quoted by a sample of providers in the Atlanta metropolitan area in 1992. The cost of an office visit,⁹ inpatient day at a community hospital,¹⁰ and hospital consultation⁹ were obtained from published data and were adjusted to 1992 dollars at a rate of increase of 6% per year.¹¹

Results

Hospitalized Patients

Cat scratch disease was listed as a diagnosis in 2828 records reported in CPHA from 1983 through 1989 and 95 records reported in NHDS from 1979 through 1989; these records represented, in each database, less than 0.01% of the total number of records. After weighting, we estimated averages of 2060 (CPHA) and 1787 (NHDS) (95% CI = 922, 2652) discharges per year of patients with a diagnosis of cat scratch disease. The estimates of the annual incidence of patients discharged with a diagnosis of cat scratch disease were 0.86 (CPHA) and 0.77 (NHDS) per 100 000 population. The incidence estimates varied from 0.59 per 100 000 population in 1988 to 1.2 per 100 000 population in 1983 for CPHA and from 0.42 per 100 000 population in 1980 to 1.5 per 100 000 population in 1982 from NHDS (Figure 1).

The age and sex distributions, regional rates, and seasonal patterns of cases derived from the CPHA and NHDS data sets were similar. Both sets showed a

higher proportion of cases among children (persons 18 years of age and younger) than adults. Forty-five percent of CPHA and 50% of NHDS case patients were younger than 15 years, and 54% of CPHA and 57% of NHDS case patients were 18 years old or younger. The highest incidence in the CPHA data set, 2.0 per 100 000 population, was in the 5 through 14-year-old age group; in the NHDS data set the peak incidence, 2.1 per 100 000, was in children younger than 5 years (Figure 2). Males were disproportionately represented. There was a higher incidence in males than in females in both data sets—1.0 and 0.93 per 100 000 males vs 0.69 and 0.60 per 100 000 females for CPHA and NHDS, respectively. Fifty-eight percent of all case patients in the CPHA data set and 60% of all case patients in the NHDS data set were males. The incidence of cat scratch disease was higher among Whites than Blacks. In the CPHA data set, the average incidence was 0.87 per 100 000 for Whites and 0.53 per 100 000 for Blacks; in the NHDS data set the average incidence was 0.78 per 100 000 for Whites and 0.5 per 100 000 for Blacks. Incidence varied by geographic region; in both data sets, the average annual incidence was lower in the West and higher in the South than in the nation as a whole (Figure 3).

Seasonal variation was observed; 59% of CPHA and 61% of NHDS case patients were admitted in the 5 months from September through January (Figure 4). Seasonality was more pronounced for the Midwest region, in which 64% of CPHA and 76% of NHDS case patients were admitted during those 5 months.

Previously described manifestations of cat scratch disease, including encephalopathy, seizures, thrombocytopenia, erythema nodosum, neuritis (brachial, peripheral, or lumbosacral), hepatitis, and osteomyelitis, were reported in 4.9% of CPHA and 8.5% of NHDS records. No patient had a diagnosis of Parinaud's oculoglandular syndrome. No fatalities were reported in NHDS; one death was recorded in CPHA, for a case-fatality rate of 0.03%.

A lymph node procedure—incision, excision, or biopsy—was recorded for 56% of CPHA and 56% of NHDS cat scratch disease case patients. Patients with cat scratch disease accounted for 0.8% of all lymph node procedures recorded for all patients in the NHDS data set from 1979 through 1989. This percentage was higher for younger age groups; cat scratch disease patients accounted for 2.7% of all patients younger than 15 years with lymph node procedures and for 7.4% of all 5- through 14-

year-old patients with lymph node procedures. Cat scratch disease patients accounted for 1.3% of all lymph node procedures performed from September through January and for 15.6% of those performed during this period in the 5- through 14-year-old age group. Data on all patients with lymph node procedures in the CPHA data set were not available.

The average duration of hospitalization for case patients in each database was 4 days (ranges: 0–373 days [CPHA] and 0–16 days [NHDS]). Approximately half of the case patients in both sets stayed 2 days or less.

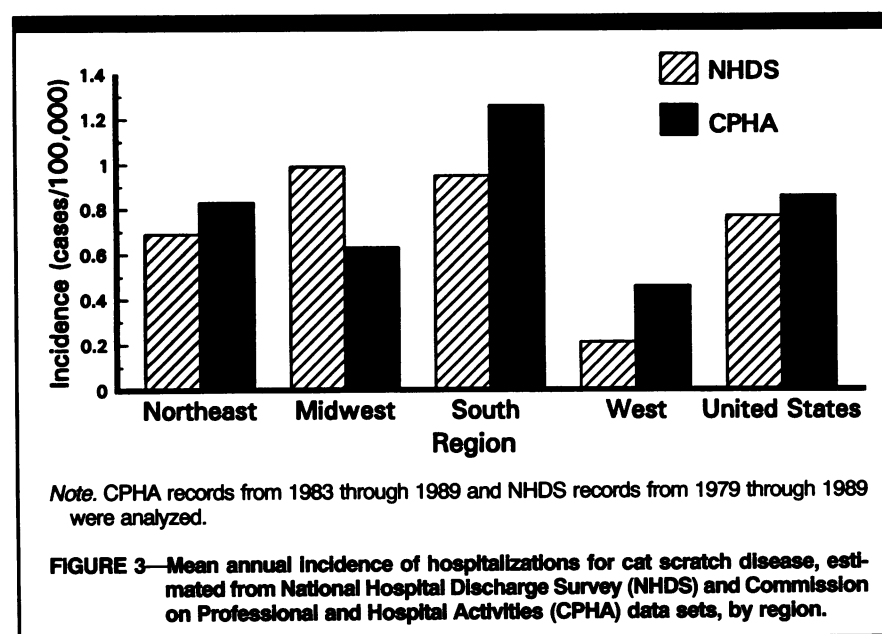
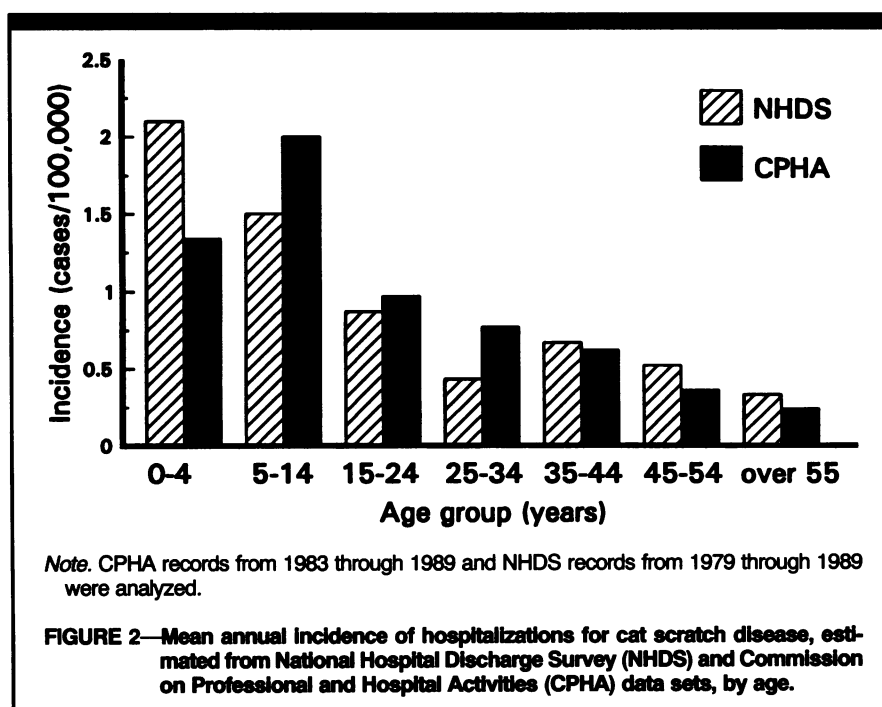
Ambulatory Patients

A total of 10 records with a diagnosis of cat scratch disease were recorded in the National Ambulatory Medical Care Surveys: 1 in 1980, 1 in 1981, 8 in 1985, and 0 in 1989. After weighting, the estimated total number of outpatient cases of cat scratch disease for those years was 87 484, for an average of 22 000 cases per year. Relative standard error could be calculated for 1985 records only; the 95% confidence interval for the estimate of 63 663 cases in 1985 was 0, 147 264. Annual incidence varied from 0 in 1989 to 26.9 per 100 000 population in 1985; the average annual incidence was 9.3 per 100 000 population. All case patients were White; 62% were male. The average age was 22 years (range: 5–33 years), and 54% were younger than 25 years. A fall/winter peak was not seen; only 33% of cases occurred between September and January.

Estimated Cost of Disease

A clinical diagnosis of cat scratch disease requires the fulfillment of three of four criteria: (1) history of cat contact, with the presence of a scratch or primary lesion; (2) positive cat-scratch skin test antigen response; (3) negative laboratory results for other causes of lymphadenopathy; and (4) characteristic pathologic findings of a lymph node.^{12,13} The skin test antigen is not standardized, licensed, or widely available; thus, to fulfill the diagnostic criteria a lymph node biopsy and laboratory tests to exclude other causes are usually needed. Therefore, most patients with suspected cat scratch disease would be expected to have a complete blood count, rapid plasma reagin, Monospot, purified protein derivative, and chest radiograph as part of a routine diagnostic evaluation.¹⁴

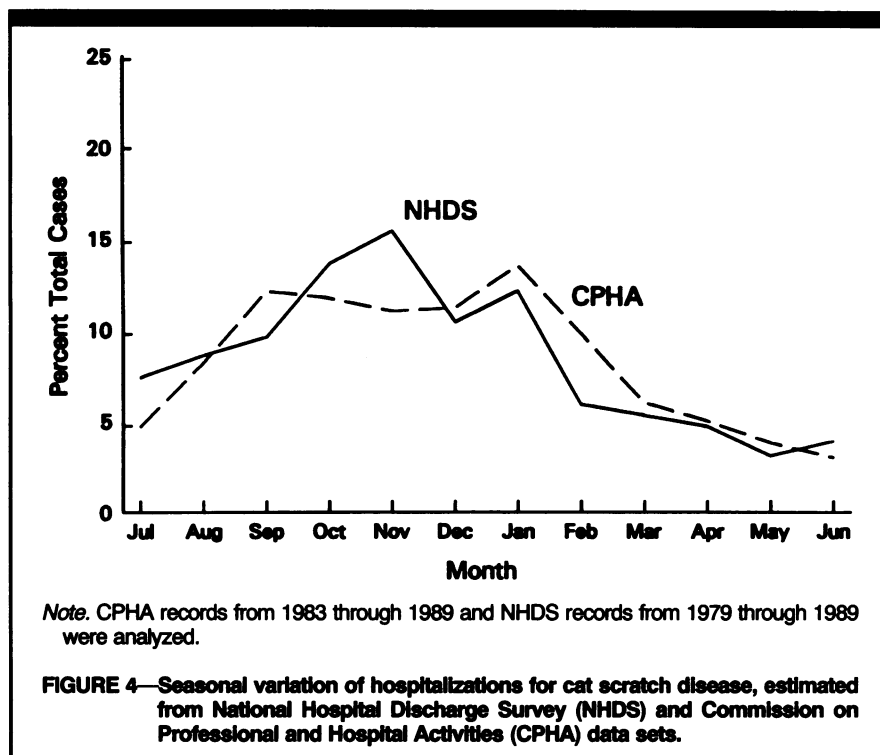
We estimated the cost of these tests to be approximately \$190. This cost, combined with the cost of an office visit (\$45),



results in a total cost of approximately \$5.2 million for the estimated 22 000 ambulatory cat scratch disease patients per year. Assuming that the cost of one inpatient day in a community hospital (\$760) with one physician visit (\$40) is incurred for each day of hospitalization and that a surgeon's fee (\$400) is billed to the 56% of the hospitalized patients who have lymph node procedures, the estimated cost for the 2000 patients hospitalized annually with cat scratch disease is \$6.9 million. Thus the estimated total health care cost of cat scratch disease, in 1992 dollars, is over \$12 million per year.

Discussion

The rates of cat scratch disease reported here are consistent with previous estimates. The incidence of patients discharged from the hospital with a diagnosis of cat scratch disease, approximately 0.8 per 100 000 population, is similar to the incidence of 0.66 per 100 000 population reported by Carithers from his mail survey of hospitals discharging over 750 pediatric patients annually.¹⁵ The estimate of overall incidence of the disease in ambulatory patients, 9.3 per 100 000 population, is just over 10 times the incidence in hospitalized



patients. This estimate is similar in magnitude to the rate of 3.3 per 100 000 reported by Margileth¹⁶ on the basis of outpatient studies in the metropolitan Washington, DC, area. Our estimate of the incidence of ambulatory cat scratch disease must be qualified, however, because it was extrapolated from very few cases; additional data, such as might be obtained from population-based surveillance, are needed for a more precise estimate.

The fall/winter peak in incidence noted in the CPHA and NHDS data sets is also congruous with previous reports.^{15,17-19} The lack of a finding of seasonality in ambulatory cases is probably due to the small number of records analyzed.

Most investigators, such as Wlodaver and Vorse²⁰ and Carithers,¹⁵ have found equal rates of disease for both sexes. Margileth,¹⁷ however, in a review of 1252 patients, noted a significantly higher percentage of cases (58%) among males. The predominance of males found in this analysis was noted consistently in all three databases and is therefore likely to reflect a true difference rather than an artifact of data collection. Previous case series have not described the racial distribution of cat scratch disease case patients; however, we found a higher incidence in Whites than in Blacks. Additional investigation of risk factors for cat scratch disease may be useful to explore possible explanations for the gender and racial differences.

The incidence of hospitalizations for cat scratch disease was higher among children than adults, and approximately 54% of CPHA cases and 57% of NHDS cases were in persons 18 years of age or younger. However, children represented a markedly smaller percentage of total cases in both CPHA and NHDS data sets than that noted in most previous reports.^{15,17,20,21} Carithers reported that 87% of his 1200 cat scratch disease patients were 18 or younger.¹⁵ Similarly, Margileth, in a study of 1400 patients, noted that 83% were younger than 21,¹⁷ and Wlodaver and Vorse, in a study of 23 patients, noted that 87% were 16 or younger.²⁰ These case series were reported by pediatricians and the patients were drawn primarily from ambulatory pediatric populations. Therefore, one explanation for the older age distribution found in our analysis is that previous studies were biased toward a younger age group because of the pediatric focus of the investigators. Disease in adults may have been underreported in those case series. This explanation is supported by the findings of Daniels and MacMurray, neither of whom were pediatricians, who described 160 cat scratch disease patients from 27 states and 8 foreign countries and found that only 66% were younger than 30 years of age.²²

Another explanation for the older age distribution found in CPHA and NHDS records is that a disproportionate number of older patients with cat scratch disease

are hospitalized, possibly because the disease is more severe in this age group. This is consistent with the finding of Margileth et al. that only 22% of cat scratch disease patients with severe, systemic disease were younger than 21,¹² compared with 87% of patients with uncomplicated cat scratch disease.¹⁷

Cat scratch disease is said to be one of the most common causes of chronic regional lymphadenopathy in children.^{18,23} In this study, we were unable to compare the incidences of cat scratch disease and other causes of lymphadenopathy in children. However, although children with cat scratch disease accounted for only 3% of lymph node procedures performed on patients younger than 15 years, 16% of lymph node procedures in children aged 5 through 14 years discharged from September through January were in patients with cat scratch disease. It can be concluded from these data that cat scratch disease does cause a significant proportion of lymphadenopathy in children and that a substantial proportion of lymph node procedures performed on children during the fall and winter months are performed because of the disease.

We estimated the annual cost of outpatient evaluation of cat scratch disease to be \$5.2 million and the cost of hospitalization to be \$6.9 million, for an estimated combined annual cost of the disease of over \$12 million. This is meant to be a minimum estimate. The actual cost is likely to be higher, since we did not attempt to include all of the health care costs that may be incurred by patients with cat scratch disease.

Although antibiotics have been suggested by several anecdotal reports to shorten the duration of illness,²³⁻²⁷ no treatment requiring hospitalization has been proven beneficial to patients with cat scratch disease. Therefore, we assume that the majority of hospitalizations for cat scratch disease are for diagnostic purposes. If this is true, the availability of a reliable, noninvasive diagnostic test would reduce the need for hospitalization. Such a test would also decrease the number of additional tests required for the diagnostic evaluation of ambulatory patients. A recent report indicates that an indirect fluorescent antibody test for detection of humoral antibodies to *Rochalimaea henselae* may be useful for diagnosis of cat scratch disease.² Assuming that such a test would allow 90% of hospitalized patients to be treated as outpatients, that this test would be widely available, and that the cost of the test and the cost of

one office visit would be the only costs incurred for outpatients, a test costing \$20 per patient would provide a yearly savings of at least \$10 million.

This analysis was limited in many reports. Cat scratch disease represented a very small proportion of the total number of records included in the databases analyzed; therefore, the standard error was large and estimates made from these data are not expected to be precise. This problem is unavoidable when researchers seek to determine the incidence of a relatively uncommon disease from surveys that extrapolate from small samples. The diagnosis was obtained from coded records and was not standardized, so some of the patients included in the analysis may not have met standard diagnostic criteria for cat scratch disease. However, the seasonal variation, which was consistent with previous reports, provides some indication that cat scratch disease was correctly coded as a diagnosis for most records. Prospective, population-based surveillance may provide a more accurate estimate of incidence; however, we believe that the results of this analysis accurately reflect the general demographic characteristics of cat scratch disease.

In summary, we estimate that cat scratch disease affects approximately 22 000 persons and results in the hospitalization of about 2000 persons each year in the United States. Adults appear to represent a higher proportion of cases than previously reported, suggesting that cat scratch disease may be more common in adults than formerly recognized and that it should be considered in the differential diagnosis of chronic lymphadenopathy in adults as well as children. □

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